Second International Conference on Archaeological Prospection

1997

Ise, Japan

Abstracts

of the

Second International Conference on Archaeological Prospection

1997

September 9 - September 12

Ise, Japan

The Roman Town of Vieil-Evreux : an Integrated Approach (multi-scale and multi-method)

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Despite many excavations since more than a century and numerous aerial surveys over the roman buried town of Vieil Evreux (West of France), important discoveries can still happen. Electrical surveying in the nearby of the known roman thermal area over more than 2ha (ploughed fields) has brought a new insight about the spatial organisation and the functioning of the thermal bath complex : accurate positioning of a fanum (temple), its internal building (cella) with even its entrance (door) facing East direction, and the discovery of aqueducts for water supply and sewage. The buried portico limiting the thermal area was made also clear. Excavations, which rely on the results of the geophysical survey, has confirmed these structures.
The information brought by aerial photos has also to be taken into account when trying to integrate the former results over a wider area : geophysical investigations cannot be systematised because they are time-consuming and in practice when the area exceeds several hectares, aerial anomalies, if they exist should be used. But to be of value for archaeologists, the results obtained from aerial photos must have a positional accuracy compatible with the accuracy of archaeological geophysical surveying and to the future diggings, that is at least better than 1 meter. Rectification of oblique aerial photos is something now usual (orthophotos, rectification) but the accuracy of the orthophotos is seldom mentioned. In the case of Vieil-Evreux, we have access to outstanding photos taken during the big drought of 1986. Rectification of these photos has proved that the overall error can exceed **8 meters** This error is partly due to the mathematical model used for the projection of course but mostly to the quality and scarceness of the control points used for computing the projection parameters and the defaults of the optics of camera. In Europe, most of the photos are taken by amateurs with ordinary 24x36 cameras. They constitute a huge fund which has not been used since now except pioneering works like the one from Scollar. Moreover, when archaeologists take the pictures, they seldom have in mind the possibility of rectification and consequently few control points can be used. Finally, one should notice that the 'best' aerial anomalies are observed in crop fields areas (open-field) where control points are scarce and where fields limits are changing nearly every year.
In the case of Vieil-Evreux, a new protocol was developed and tested : control points were added using the following assumption : on the area surveyed by the geophysical team, some individual electrical anomalies can be delimited and assumed to be in concordance with the phytologic patterns (difference in colour and/or retarded or advanced growth of crops) observed on the aerial photos. Since the geophysical anomalies are referred to a national grid system (Conical Lambert projection), they can be used as control points for the rectification. Dozen of points were extracted and added to the original set. When rectification was finished, we were able to compute a root mean square error of **0.8m**. Adding the 'geophysical' control points proved to be feasible and has reduced the overall error to a minimum acceptable by the archaeologist. With the transcription of the numerous anomalies observed on the orthophotos, it was then possible to expand our archaeological knowledge to an area of more than 25 ha around the thermal baths. Several photos were then separately rectified in order to get a mosaic of pictures to cover the whole site. Accuracy can also be checked at this point when looking at the overlapping features at the boarders of each photographs.
Finally, the use other technics like magnetometry scanning and surface gathering can be integrated to the data already acquired and will constitute what we call a 'non-destructive data base' which has preserved the archaeological site for the future generations.